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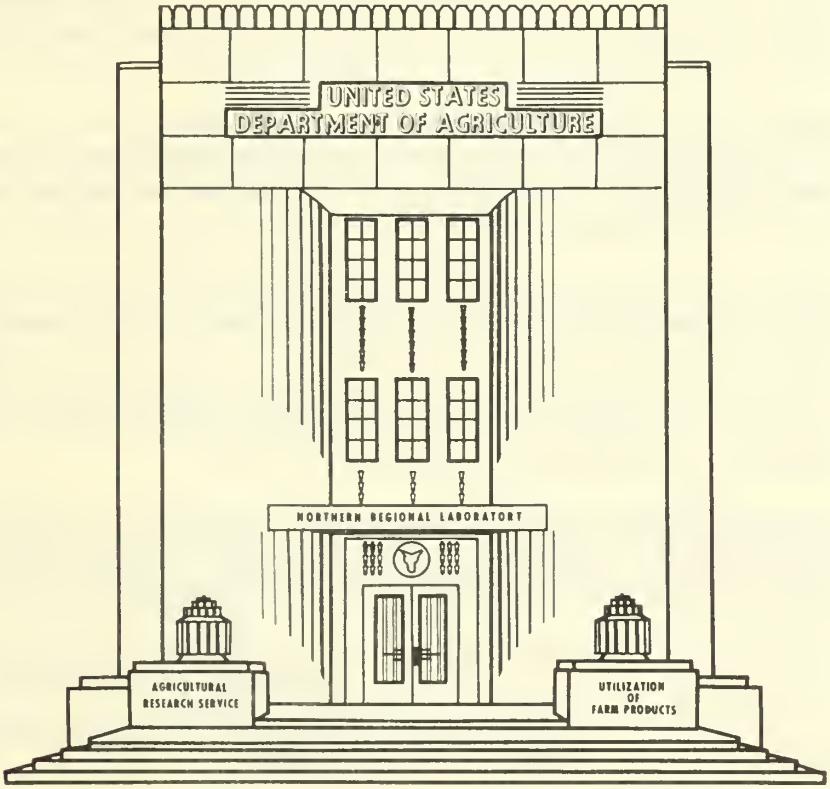
PUBLICATIONS AND PATENTS

of the
NORTHERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION
Peoria, Illinois, for the period
JANUARY - JUNE 1961


UNITED STATES
DEPARTMENT OF AGRICULTURE
NORTHERN REGIONAL LABORATORY
AGRICULTURAL RESEARCH SERVICE
UTILIZATION OF FARM PRODUCTS

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

Congress in 1938 authorized four regional laboratories to conduct basic and applied research designed to expand, improve and develop through science and technology the utilization of American farm crops. Agricultural products assigned the Northern Division are: *The cereal grains*--corn, wheat, barley, grain sorghum, and oats; *the oilseeds*--soybean, flaxseed, safflower, and erucic acid-containing oilseeds; and *new crops*. The abstracts in this list describe current research on these commodities and indicate progress achieved by the Northern Division

Northern Division publications are available, in conformance with the policy of the Department of Agriculture, to scientists and other specialists, librarians, representatives of the press, and others interested. Titles of publications no longer available are marked with an asterisk (*).

Requests for specific reprints should be addressed to: Northern Utilization Research and Development Division, 1815 North University, Peoria, Illinois. Mailing lists are not maintained except for the list of Publications and Patents.

Most of the publications are reprints of articles published in journals that are available in libraries. Any one who needs information may obtain it most efficiently by consulting a technical library. Photographic copies of most journal articles on research at this Division can be purchased from the Library of the U. S. Department of Agriculture, Washington 25, D. C.

No publications will be sent regularly in response to foreign requests unless exchange arrangements have been made with: Director, Library of the Department of Agriculture, Washington 25, D. C.

Printed copies of patents, which are assigned to the Secretary of Agriculture, can be obtained only by purchase (25 cents each) from the Commissioner of Patents, U. S. Patent Office, Washington 25, D. C. Order by number, do not send stamps.

Previous lists of publications and patents were issued as NM-305, AIC-187, and AIC-318, with supplements. Copies of these lists are available on request.

January - June 1961

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PUBLICATIONS

[Publications marked (*) are not available for distribution.
When requesting reprints, please order by number.]

1325 AGE-OLD USES OF SEEDS AND SOME NEW ONES.
Frederic R. Senti and W. Dayton Maclay.[1] ([1]Assistant Administrator, ARS).
Yearbook Agr., 1961.
U. S. Dept. Agr. Pp. 27-36.

Seeds have been used for food and feed since prehistoric times. Today, many industrial products depend upon seeds. The primary uses of seeds for these three outlets are indicated, as well as the expanded research program by USDA to find new crops, and seeds, for modern industrial needs.

1248 CHEMICAL CHANGES ACCOMPANYING FLAVOR DETERIORATION OF VEGETABLE OILS.
C. D. Evans.
Proc. Flavor Chem. Symposium, Campbell Soup Co. Pp. 123-146. 1961.

Studies on autoxidation at the Northern Laboratory and those reported in the literature are reviewed. The flavor spectrum of aldehydes, dialdehydes, aldehyde esters, alcohols, and hydrocarbons derived from the decomposition of fatty acid hydroperoxides are discussed, and an organized mechanism for their formation is indicated.

1287 * THE EARLY HISTORY OF GIBBERELLIN RESEARCH.
B. B. Stowe,[1] F. H. Stodola, T. Hayashi,[2] and P. W. Brian.[3] ([1]Harvard University; [2]National Institute of Agricultural Sciences, Japan; [3]Imperial Chemical Industries, England)
Plant Growth Regulation. In "Plant Growth Regulation," 4th Intern. Conf. August 10-14, 1959, Yonkers, N. Y., sponsored by the Boyce Thompson Institute, The New York Botanical Garden, and the Brooklyn Botanic Garden. The Iowa State University Press, Ames, pp. 465-471. 1961.

Original difficulties and problems encountered with the gibberellins on three continents presented by representatives from the Japanese, British, and American groups.

1032 GRAIN SORGHUM UTILIZATION RESEARCH.
W. D. Maclay.
In "The Grain Sorghum Challenge." Eds. Jesse L. Ward and R. H. Browder, published by Texas Electric Service Company, Forth Worth, in cooperation with The Agricultural Committee, West Texas Chamber of Commerce. Chapter 7, pp. 39-51. 1961.

A presentation covering work done by industry, USDA, and private research foundations to develop the industrial utilization of sorghum grain.

1213 RESEARCH REPORT: LOW PROTEIN FRACTIONS FROM SOFT WHEAT AND HARD WHEAT FLOURS AT NRRL LABORATORY.
V. F. Pfeifer, A. C. Stringfellow, and E. L. Griffin, Jr.
Consolidated Grain Milling Catalogs and Engineering Bluebook, 12th Edition, The National Provisioner, Chicago, Ill., pp. 195-198. 1960-1961.

Flour fractions of minimal protein content were produced in maximum yield from typical soft and hard U. S. wheat flours, by various combinations of fine grinding and air classification. The purpose of the experiments was to determine the general kinds of flours best suited for producing low-protein fractions for use in industrial products. Lowest protein fraction obtained, containing 1.4% protein, was from white club wheat from the Pacific Northwest.

1233 * USING GERM PLASM FOR NEW PRODUCTS.
Quentin Jones[1] and Ivan A. Wolff. ([1]USDA Crops Research Division, Beltsville, Md.)
In "Germ Plasm Resources." A Symposium Presented at the Chicago Meeting of AAAS, December 28-31, 1959. Ed. Ralph E. Hodgson. Am. Assoc. Advance Sci. No. 66, IV, pp. 265-277. Washington, D. C. 1961.

Research on screening and use of plant germ plasm for new products to serve agricultural and industrial needs is discussed. Promising sources of these new products are being found by determining the total oil and protein content of seeds, identifying the fatty acids in seed oils, and studying the chemical composition and physical characteristics of plant stalks. The utilization significance of progress to date is shown by specific examples.

1210 AMINO ACID COMPOSITION OF TWENTY-SEVEN SELECTED SEED MEALS.
C. H. VanEtten, R. W. Miller, I. A. Wolff, and Quentin Jones.[1]
([1]USDA Crops Research Division, Beltsville, Md.)
J. Agr. Food Chem. 9(1): 79-82. January-February 1961.

Seed meals obtained from 27 genera of 13 botanical families were analyzed for their acid-stable amino acid content by the Moore, Spackman, and Stein ion-exchange chromatographic method and for tryptophan by a modified Spies and Chambers procedure. Comparison of the amino acid compositions with the requirements for optimum growth of the rat and the chick showed some of the seed meals to be well balanced. The majority were deficient in methionine-cystine, lysine, or both. Lysine content varied from 2.5 to 6.9 grams and methionine from 0.5 to 2.3 grams per 16 grams of nitrogen. Three genera from the legume family contained canavanine, which was identified after isolation from Sesbania exaltata.

1229 COUNTERCURRENT DISTRIBUTION OF SOYBEAN FATTY ACID METHYL ESTERS BIOSYNTHETICALLY LABELED WITH H^3 AND C^{14}.
H. J. Dutton, E. P. Jones, C. R. Scholfield, W. Chorney[1], and N. J. Scully[1]. ([1]Argonne National Laboratories, Chicago, Ill.)
J. Lipid Res. 2(1): 63-67. January 1961.

Methyl esters of soybean fatty acids uniformly labeled with C^{14} and with H^3 were biosynthesized by growing soybean plants in (a) $C^{14}O_2$ atmosphere and (b) tritiated water. Radioactive soybean oils were extracted from the two samples of harvested beans and transesterified with methanol. The individual fatty acid methyl esters were isolated by countercurrent distribution.

1201 A FERMENTATION PILOT PLANT STUDY FOR MAKING PHOSPHOMANNAN.
S. P. Rogovin, V. E. Sohns, and E. L. Griffin, Jr.
Ind. Eng. Chem. 53(1): 37-40. January 1961.

Industrially important polysaccharide hydrocolloids now are obtained exclusively from plant sources. A survey at the Northern Laboratory revealed that exocellular polysaccharides could be synthesized by the actions of microorganisms on starch-derived saccharides.

Fermentation of media, containing 6% dextrose, seeded with 5% inoculum of the yeast Hansenula holstii NRRL Y-2448, and cultured aerobically at 82° F., is complete in 96 hours. A white polymer is recovered in yields of 43% from the fermentation broth by precipitation with methanol in the presence of an electrolyte. Preliminary cost estimates show that phosphomannan can be produced for 87 cents a pound. This price can be materially reduced by substituting a more economical nutrient source and by improving the recovery method.

Production of phosphomannan provides a domestic source for a polymer having properties similar to many of imported gums.

1211 A NOTE ON THE EFFECT OF STEEPING TIME ON WET-MILLING HIGH-AMYLOSE CORN CONTAINING 57-PERCENT-AMYLOSE STARCH.
R. A. Anderson, C. Vojnovich, and E. L. Griffin, Jr.
Cereal Chem. 38(1): 94-97. January 1961.

Steeping high-amylose corn (57% amylose) for different periods of time significantly effected removal of solubles from the corn and the yield of starch. After 16 hours of steeping, 2.3% solubles were removed from the corn, as compared to 3.6% in a 48-hour period. The yield of starch from corn steeped for 16 hours was 41.0%, whereas a 43.5% yield was obtained from the longer steep.

1212 WET-MILLING HIGH-AMYLOSE CORN CONTAINING 66- TO 68-PERCENT AMYLOSE STARCH.
R. A. Anderson, C. Vojnovich, and E. L. Griffin, Jr.
Cereal Chem. 38(1): 84-93. January 1961.

High-amylose corn lots with starch containing up to 68% amylose, obtained from two corn breeders, were wet-milled on a laboratory and pilot-plant scale, to gather information pertinent to the genetic development of this new corn. Processing characteristics of an inbred sample with starch of 68% amylose content were poorer than those observed in the wet-milling of corn with lower amylose contents. Another corn sample, a hybrid with starch containing 66.7% amylose, exhibited extremely good wet-milling characteristics, contrary to a previously apparent pattern of increasingly poor processing as the amylose content of corn increased. The recovery of 82.7% of the starch present was over 10% greater than the amount recovered from corn containing 57%-amylose starch. The 0.48% protein content of the starch recovered from the 66.7%-amylose corn is comparable to that of ordinary corn starch. Differences in genetic background probably account for the marked improvement in processing characteristics.

1218 CHARACTERIZATION AND PROPERTIES OF THE PHOSPHOMANNAN FROM _HANSENULA_ _HOLSTII_ NRRL Y-2448.
Allene Jeanes, J. E. Pittsley, P. R. Watson, and R. J. Dimler.
Arch. Biochem. Biophys. 92(2): 343-350. February 1961.

Microbial fermentation of starch-derived sugars to produce exocellular polysaccharides differing basically from starch in composition and properties is being investigated as a desirable route to new types of useful substances through utilization of an abundant raw material. Chemical and preliminary physical characterizations are reported for the first product from this endeavor, a phosphorylated mannan produced from glucose by the bisexual diploid yeast, _Hansenula_ _holstii_ NRRL Y-2448. This unusual substance is of fundamental biochemical and physiochemical interest, and it has practical possibilities as a new type of polyelectrolyte due to its ease of production in good yields, to the viscous properties of its clear, thixotropic solutions, and to other inherent properties.

1207 GLYCERIDE STRUCTURE OF VEGETABLE OILS BY COUNTERCURRENT DISTRIBUTION. V. COMPARISON OF NATURAL, INTERESTERIFIED, AND SYNTHETIC COCOA BUTTER.
H. J. Dutton, C. R. Scholfield, and T. L. Mounts.
J. Am. Oil Chemists' Soc. 38(2): 96-101. February 1961.

Countercurrent distribution, gas chromatography, and isotopic dilution methods are employed to determine the glyceride structure of cocoa butter. The observed fractionation of glycerides is accounted for by assuming that palmitic and stearic acids are randomly esterified on the 1 and 3 positions of glycerol and that oleic is on the 2 position as demonstrated by other workers. Complete randomization of the specific structure of cocoa butter through the application of interesterification catalysts greatly alters its physical properties, including its countercurrent distribution pattern. A glyceride synthesized according to the "1,3 random palmito-stearo-2-olein" concept has properties similar to natural cocoa butter.

1213 * NEW DATA: LOW PROTEIN FRACTIONS FROM SOFT WHEAT AND HARD WHEAT FLOURS. NEW FLOUR-FRACTIONATION DATA SUMMARIZED.
V. F. Pfeifer, A. C. Stringfellow, and E. L. Griffin, Jr.
Am. Miller & Processor 89(2): 14, 15, 32. February 1961.

Fractions were produced from each of six typical soft and hard U. S. wheat flours by air classification of the original flour to obtain an initial fraction of low-protein content. This starchy fraction was reprocessed by regrinding and reclassification to obtain material of minimal protein content. Fractions containing as little as 1.4% protein were obtained from very soft wheat flour, whereas the minimum protein content obtainable from hard red winter wheat flour was 4.9%. Recovery of low-protein fractions from a given flour was facilitated by efficient initial separation of a suitable stock for reprocessing, and by maximum regrinding of this stock without damage to starch granules before reclassification.

This article is a condensed version of a detailed study published in the No. 12 edition of the "CONSOLIDATED GRAIN MILLING CATALOGS," The National Provisioner, Chicago, Ill., pp. 195-198 (1961).

1228 OCCURRENCE OF MALVALIC, STERCULIC, AND DIHYDROSTERCULIC ACIDS TOGETHER IN SEED OILS.
C. R. Smith, Jnr., T. L. Wilson, and K. L. Mikolajczak.
Chem. & Ind. (London) (8): 256-257. February 25, 1961.

Sterculic acid, a major component fatty acid of *Sterculia foetida* seed oil shown by Nunn to have structure, was the first cyclopropenoid acid found in nature. A homolog, malvalic acid, was later found in *Malva* seed oils. Evidence now shows that two malvaceous seed oils--*Hibiscus syriacus* and *Lavatera trimestris*--have malvalic acid as their chief cyclopropenoid constituent. *H. syriacus* oil contains considerably larger amounts than other known sources. In addition, each oil contains a much smaller amount of sterculic acid. Evidence also indicates that sterculic acid in *Sterculia foetida* oil is accompanied by a relatively small amount of malvalic acid.

1219 STRUCTURAL BOARD FROM DOMESTIC TIMBER BAMBOO--PHYLLOSTACHYS BAMBUSOIDES.
T. R. Naffziger, T. F. Clark, and I. A. Wolff.
TAPPI 44(2): 108-112. February 1961.

Dry, mature timber bamboo was investigated as a raw material for the preparation of insulating and hardboards by several selected pulping techniques. Based on results of small-scale pulping with caustic soda, kraft chemicals, neutral sulfite, and lime or combinations of lime and caustic soda, lime alone was selected for detailed investigation as the chemical for preparing rapid- and slow-draining pulps. Insulating boards and hardboards were prepared from blends of two kinds of pulps and evaluated for strength characteristics. Experimental insulating boards had strength properties equal to or exceeding those of commercial boards. Experimental hardboards had values for modulus of rupture and tensile strength comparable to those for standard commercial hardboard. Experimental boards were more flexible than commercial boards.

1216 ANALYSES OF LIPIDS AND OXIDATION PRODUCTS BY PARTITION CHROMATOGRAPHY. DIMERIC AND POLYMERIC PRODUCTS.
E. N. Frankel, C. D. Evans, Helen A. Moser, D. G. McConnell, and J. C. Cowan.
J. Am. Oil Chemists' Soc. 38(3): 130-134. March 1961.

A partition chromatographic method for estimating dimer content of fats was developed using silicic acid containing absorbed methanol as the stationary phase and 2% methanolic benzene as the mobile phase. Analysis of different vegetable oils by this method indicated that the dimer contents ranged from 1 to 3%. A linear relation was obtained between the dimeric content of vegetable oils and their peroxide value before deodorization. The method is useful in assessing the extent of oxidation that an oil has received before deodorization. A measure of this "hidden oxidation" may serve as an index to estimate the future stability of edible oils.

1215 ANALYSES OF LIPIDS AND OXIDATION PRODUCTS BY PARTITION CHROMATOGRAPHY. FATTY ACID HYDROPEROXIDES.
E. N. Frankel, C. D. Evans, D. G. McConnell, and E. P. Jones.
J. Am. Oil Chemists' Soc. 38(3): 134-137. March 1961.

A liquid partition chromatographic method was developed to isolate and determine hydroperoxides in autoxidized fatty acids and their methyl esters. Saponification of autoxidized fatty esters destroyed the peroxides as determined iodometrically and converted them to conjugated *cis-trans* and *trans-trans* hydroxy fatty acids. Fatty ester hydroperoxides were isolated chromatographically in yields and purity comparable to those reported in the literature by countercurrent distribution.

1234 CORRECT DESCRIPTION OF PSEUDOMONAS MILDENBERGII BERGEY ET AL., 1930.
William C. Haynes.
J. Bacteriol. 81(3): 385-386. March 1961.

Although Bergey's Manual of Determinative Bacteriology is the most up-to-date, comprehensive compilation of descriptions of bacteria available to bacteriologists, it has in the past been prepared under handicaps which made mistakes inevitable. Many errors were subsequently corrected, but some escaped detection, even in the latest edition. This paper corrects one of these by presenting the correct description of Pseudomonas mildenbergii which, due to a faulty translation of the original description from German, has been incorrect in all editions of the Manual since its first inclusion in 1930.

1220 FORMATION OF METHYL AZELAALDEHYDATE ON AUTOXIDATION OF LIPIDS. (Letter to the Editor.)
E. N. Frankel, Janina Nowakowska, and C. D. Evans.
J. Am. Oil Chemists' Soc. 38(3): 161-162. March 1961.

Methyl azelaaldehydate was identified by gas chromatography in autoxidized methyl esters of fatty acids and of soybean and linseed oils. This evidence points to a new type of cleavage occurring during autoxidation of lipids which would lead to a new series of substances that may contribute to flavor reversion of oils.

1311 * INDUSTRIAL POTENTIAL FOR GRAIN SORGHUM.
K. R. Majors
Digest of Papers Presented. 2nd Grain Sorghum Research and Utilization Conference, Amarillo, Texas. Agricultural Development Dept. Southwestern Public Service Co. Pp. 25-30. March 7-8, 1961.

A review of research to find new industrial uses for various cereal grain products, emphasizing the potential of grain sorghum.

1226 PENTOSE OXIDATION BY PSEUDOMONAS FRAGI.
Ralph Weimberg.
J. Biol. Chem. 236(3): 629-635. March 1961.

Growing and resting cells of Pseudomonas fragi oxidize D-arabinose, L-arabinose, D-xylose, and D-ribose to lactones of the corresponding pentonic acids. L-Arabono-γ-lactone, D-xylono-γ-lactone, and D-ribono-γ-lactone accumulate in the reaction mixtures, presumably because the cells do not possess delactonizing enzymes active on these compounds. The accumulation of D-arabonic acid instead of the lactone is correlated with the presence of a lactonase for this compound in the cells. Resting cell suspensions are able to oxidize all four pentonic acids.

Cell-free preparations oxidize each pentose to the pentono-γ-lactone. For D-arabinose, the enzyme system is soluble and requires DPN or TPN as a hydrogen acceptor. The enzymes oxidizing the other three pentoses are located in the particulate fraction and are coupled directly to oxygen. The next step is, undoubtedly, a delactonization, but only in the case of D-arabono-γ-lactone can it be shown to be an enzyme-catalyzed reaction. It has not been possible to demonstrate the oxidation of ribose beyond the lactone level in extracts. Sugar acids of the remaining three pentoses are dehydrated to a 2-keto-3-deoxy sugar acid (probably 2-keto-4,5-dihydroxyvaleric acid) which, in turn, is oxidized to α-ketoglutaric acid. The enzymes catalyzing these steps are all located in the soluble fraction of cell-free extracts and require either DPN or TPN for activity.

1214 PRESERVATION OF INFECTIOUS MILKY DISEASE BACTERIA BY LYOPHILIZATION.
William C. Haynes, Grant St. Julian, Jr., Margaret C. Shekleton, Harlow H. Hall, and Haruo Tashiro.[1] ([1]USDA Entomology Research Division).
J. Insect Pathol. 3(1): 55-61. March 1961.

Pure cultures of *Bacillus popilliae* Dutky and *B. lentimorbus* Dutky may be preserved by lyophilization and remain viable for at least 20 months, thus providing a method for assuring a source of cultures of known characteristics for laboratory and other purposes. Furthermore, the ability of cultures, so preserved, to initiate milkiness in larvae of the Japanese beetle and European chafer is not destroyed. Data show that the degree of infectivity varies between species and strains for each microorganism and host insect and point to the need for conducting pure culture investigations with strains of known characteristics.

1217 SAFFLOWER OIL ADDUCTS AS PLASTICIZERS.
H. M. Teeter, J. C. Cowan, L. E. Gast, W. J. Yurgen,[1] and R. A. Clark.[1] ([1]Battelle Memorial Institute.)
J. Am. Oil Chemists' Soc. 38(3): 117-120. March 1961.

Nineteen different esters, epoxidized esters, and related products based on Diels-Alder adducts derived from safflower oil were evaluated as potential plasticizers and stabilizers for polyvinyl chloride (PVC) and nitrile rubber (Buna N). Five of the products tested appeared promising as secondary plasticizers for PVC. Although none had a favorable effect on the heat stability of PVC, several were effective stabilizers against deterioration by light. Four products showed particular promise as plasticizers for nitrile rubber.

1235 *STREPTOMYCES ALBUS* (ROSSI-DORIA) WAKSMAN ET HENRICI: TAXONOMIC STUDY OF STRAINS LABELED *STREPTOMYCES ALBUS*.
T. G. Pridham and A. J. Lyons, Jr.
J. Bacteriol. 81(3): 431-441. March 1961.

A review of the literature and a taxonomic study of a number of strains of Streptomyces albus have been made. The results indicate that two entirely different concepts regarding Streptomyces albus have existed since 1916.

The earlier concept suggests recognition of some member of the Streptomyces griseus group as the neotype of Streptomyces albus sensu Rossi-Doria and other investigators.

The other concept centers around streptomycetes that possess these characteristics: coiled fruiting bodies with catenulate, elongated, ovoidal, smooth-walled spores; a cretaceus (chalk-white often tinged with pink) sporulating aerial mycelium; non-chromogeneity; inability to form hydrogen sulfide; and poor growth on Czapek's solution agar.

1245 WATER ABSORPTION OF SOYBEANS.
Allan K. Smith and Arlo M. Nash, with the technical assistance of Letta I. Wilson.
J. Am. Oil Chemists' Soc. 38(3): 120-123. March 1961.

The rate of water absorption of U. S. and Japanese soybeans was measured at 10° and 25° C., and at initial moisture levels ranging from 7.5 to 14.0%. The principal controlling factor in absorption of water is the seed coat. However, the rate of water absorption of sound whole beans is also influenced by the initial moisture level in the beans; the lower the moisture the slower the rate. The presence of hard beans also reduces the rate of water absorption. Usually U. S. soybeans have lower moisture and contain more hard ones than do Japanese beans. These factors are attributed to climatic differences of the two countries. No fundamental differences were found in the rate of water absorption of U. S. and Japanese soybeans.

1227 ERYTHRITOL AND ETHYLENE GLYCOL FROM DIALDEHYDE STARCH.
F. H. Otey, J. W. Sloan, C. A. Wilham, and C. L. Mehltretter.
Ind. Eng. Chem. 53(4): 267-268. April 1961.

Recent development of a low-cost method for preparing periodate oxystarch gave impetus to the search for an improved procedure for obtaining erythritol and ethylene glycol from this product.

Erythritol and ethylene glycol are obtained in yields of over 90% of theory by a single-stage process in which a high concentration of periodate oxystarch in water suspension is hydrogenated in the presence of a nickel catalyst either supported on kieselguhr or mixed with activated carbon.

This technique provides a means for obtaining erythritol on an economically feasible basis.

1222 GLYCERIDE STRUCTURE OF VEGETABLE OILS BY COUNTERCURRENT DISTRIBUTION. VI. CORN OIL.
C. R. Scholfield, Janina Nowakowska, and H. J. Dutton.
J. Am. Oil Chemists' Soc. 38(4): 175-177. April 1961.

Corn oil has been fractionated in a 200-tube countercurrent distribution apparatus. Although this technique gives no information about the positional isomers of the glycerides, the fatty acid composition of the fractions and the amounts of the more unsaturated triglycerides are in agreement with an essentially random pattern.

1223 HYDROGENATION OF LINOLENATE. II. HYDRAZINE REDUCTION.
C. R. Scholfield, E. P. Jones, Janina Nowakowska, E. Selke, and H. J. Dutton.
J. Am. Oil Chemists' Soc. 38(4): 208-211. April 1961.

Chemical reduction of linolenic acid with hydrazine, in contrast to catalytic reduction, gives no geometric or position isomerization of double bonds. Three dienes and three monoenes were identified with cis bonds in "natural" positions.

1225 LIST OF PUBLICATIONS AND PATENTS OILSEEDS AND RELATED SUBJECTS. 1960.
North. Util. Res. Devlpmt. Div., Agr. Res. Serv., U. S. Dept. Agr.
ARS-71-5, Suppl. 6, April 1961. 5 pp. (Processed).

1246 PHLEOMYCIN, AN ANTIBIOTIC MARKEDLY EFFECTIVE FOR CONTROL OF BEAN RUST.
B. C. Smale,[1] M. D. Montgillion,[1] and T. G. Pridham. ([1]USDA Crops Research Division, Beltsville, Md.)
Plant Disease Reptr. 45(4): 244-247. April 15, 1961.

The antibiotic phelomycin was shown in greenhouse studies to be a markedly effective therapeutant and protectant for bean rust (Uromyces phaseoli (Pers.) Wint. var. typica Arth.). The effects of phleomycin at a concentration of 5 p.p.m. applied to upper surfaces of primary leaves at intervals of 5, 2, or 1 day before or after inoculation of their lower surfaces indicated that the absorbed antibiotic exerted a high degree of both protectant and curative action against the rust fungus. The ED-50 value for phleomycin applied to the upper primary leaf surfaces 1 hour before inoculation of the lower leaf surfaces was 0.1 p.p.m. Inoculation of the lower leaf surfaces, which 1 hour earlier had been sprayed with phleomycin, resulted in an ED-50 value of only 0.01 p.p.m. No disease occurred when primary leaves were inoculated within 24 hours after application of low concentrations of the antibiotic to roots or stems. Data from studies involving application of the antibiotic to proximal or distal half-leaves suggested that translocation of the antibiotic is associated with the transpiration stream.

1254 PREPARATION AND PHYSICAL CHARACTERISTICS OF CROSS-LINKED HYPOCHLORITE-OXIDIZED CORN STARCH.

R. L. Mellies, T. E. Yeates, C. L. Mehltretter, and F. R. Senti.
Stärke 13(4): 114-116. April 1961.

Corn starch has been cross-linked in a closed system with epichlorohydrin at levels of 1,000 to 25 AGU/CL. Oxidation with sodium hypochlorite gave products which in 5% concentration gelatinized in a Corn Industries Viscosimeter in 2 to 3 minutes at 60° to 70° C. Higher and more stable viscosities, especially at the 200 to 250 AGU/CL level, were obtained than with noncross-linked oxystarches. The pastes had excellent clarities and were resistant to set-back. Yields in the preparation of the 1,000 to 200 AGU/CL oxystarches ranged from 93 to 95%. Changes in pH and the presence of sodium chloride altered considerably the viscosity behavior of the oxystarches.

1241 PRODUCTION OF POLYSACCHARIDE WITH XANTHOMONAS CAMPESTRIS.

S. P. Rogovin, R. F. Anderson, and M. C. Cadmus.
J. Biochem. Microbiol. Technol. Eng. 3(1): 51-63. April 1961.

Industrially important polysaccharides are now primarily obtained from plant sources. One exception is the exocellular bacterial polysaccharide, dextran. A survey at the Northern Laboratory revealed that many other microbial polysaccharides could be synthesized by the action of microorganisms on starch-derived saccharides. Previous publications from this laboratory describe the production of the microbial polymer, phosphomannan, synthesized by the yeast Hansenula holstii. This paper describes the production of another polysaccharide, synthesized by the bacterium Xanthomonas campestris NRRL B-1459.

Fermentation of media containing 3% dextrose, seeded with 5% inoculum of X. campestris NRRL B-1459 and cultured aerobically at 28° C., is complete in 96 h. A light tan polymer is recovered in yields of 50%, based on commercial dextrose, from the viscous fermentation broth by precipitation with methanol in the presence of an electrolyte. The viscosities of aqueous resolutions containing 1 and 2% polymer were 3,000 cp. and 11,000 cp., respectively.

1243 A UNIQUE FATTY ACID FROM LIMNANTHES DOUGLASII SEED OIL: THE C_{22} DIENE.

M. O. Bagby, C. R. Smith, Jr., T. K. Miwa, R. L. Lohmar, and I. A. Wolff.
J. Org. Chem. 26(4): 1261-1265. April 1961.

The C_{22} dienoic fatty acid of Limnanthes douglasii seed oil (representing 10% of the total fatty acid content) is shown to be the previously unknown cis-5-cis-13-docosadienoic acid.

1236 AIR CLASSIFICATION OF PACIFIC NORTHWEST SOFT AND HARD WHEAT FLOURS.
V. F. Pfeifer, A. C. Stringfellow, and E. L. Griffin, Jr.
Northwest. Miller 265(9): 22-25. May 1, 1961.

Long patent flours from four popular varieties of Pacific Northwest wheat--Omar, Brevor, Burt, and Rio--were fractionated by fine grinding and air classification. Low-protein blends separated from each of these flours were reprocessed in order to separate fractions of minimal protein content.

The greatest range in protein content of fractions from the initial classification (1.3 to 25.1%) was obtained from the Brevor SWW flour. No fraction containing over 17% protein was obtained from the Omar club wheat flour, whereas fractions containing above 20% protein were obtained from the other flours. Minimum protein content attained in reprocessing low-protein blends from these flours was 1.0%, from Brevor SWW wheat flour.

1256 FLAVOR OF BREAD AND PASTRY UPON ADDITION OF MALTOL, ISOMALTOL, AND GALACTOSYLISOMALTOL.
J. E. Hodge and Helen A. Moser.
Cereal Chem. 38(3): 221-228. May 1961.

A chemical method of preparing isomaltol developed recently in the Northern Laboratory has permitted for the first time extensive investigation of this compound. Similarity of the odor of isomaltol to the fragrant, caramel-like odor of maltol prompted a flavor comparison of the two compounds in aqueous and breadlike media. Both compounds have been reported as minor constituents of bread.

Taste panel results show that maltol and isomaltol give similar caramel-like flavors, sometimes described as fruity. Isomaltol is generally described as sweeter, less bitter, weaker, and, at times, less pleasant than maltol. When each is incorporated in yeast rolls at 0.1% of the flour weight, flavor difference in the breads is frequently detected. The flavor is described as similar to that of the control fresh bread, only stronger; isomaltol is the more volatile, and much of it is lost during baking.

The β-D-galactoside of isomaltol, easily prepared from milk sugar, has a bitter taste. In fermenting doughs, it is split into isomaltol and galactose and, in some baking pastries, by heat and moisture. Pie crust that contained 0.5% O-galactosylisomaltol before baking was preferred by tasters over the control.

1258 FOOD USES AND PROPERTIES OF SOYBEAN PROTEIN. I. FOOD USES.
Allan K. Smith and Walter J. Wolf.
Food Technol. 15(5): 4-6, 8, 10. May 1961.

Whole soybean may be baked, boiled, used for making sprouts, fresh and dried tofu, vegetable milk, yuba, and many fermented products. In the U. S. the trend had been to use a special grade of defatted soybean meal and of protein concentrates derived from the meal. These fractions include the acid-precipitated protein, soluble soybean proteinate, protein concentrate 70, aerating agents, soy flour, and alcohol-washed or Gelsoy-type products. These products are used not alone but combined in standard-type food products for their functional effect or for improvement of protein nutrition. Food use of U. S. soybeans is expanding more rapidly in foreign countries than domestically.

1257 FOOD USES AND PROPERTIES OF SOYBEAN PROTEIN. II. PHYSICAL AND CHEMICAL PROPERTIES OF SOYBEAN PROTEIN.
Walter J. Wolf and Allan K. Smith.
Food Technol. 15(5): 12, 13, 16, 18, 21, 23, 26, 28, 31, 33. May 1961.

Electrophoresis and ultracentrifugation show that soybeans contain a mixture of proteins. About 90% of the extractable proteins are globulins, and ultracentrifugal studies indicate four fractions having sedimentation constants of 2, 7, 11, and 15S. The 7S and 11S globulins have been partially purified and characterized. Little is known about the 2S and 15S fractions. The 7S globulin is dissociable into subunits, associates to higher molecular weight, and forms disulfide polymers. The 11S globulin has a molecular weight of about 350,000 and undergoes reactions similar to those of the 7S globulin. The 7S and 11S globulins are not interconvertible by association-dissociation reactions, which indicates that they are different proteins rather than aggregates of identical subunits. The whey fraction obtained in soybean protein isolation is a mixture of low-molecular-weight proteins. Two trypsin inhibitors, hemagglutinin, and three other fractions have been separated from whey protein by chromatographic methods.

1231 LIST OF PUBLICATIONS AND PATENTS ON ANTIBIOTICS (OTHER THAN PENICILLIN).
North. Util. Res. Devlpmt. Div., Agr. Res. Serv., U. S. Dept. Agr. ARS-71-18, May 1961. 5 pp. (Processed).

1260 LYSINE, METHIONINE, AND TRYPTOPHAN CONTENT OF MICROORGANISMS. III. MOLDS.
R. A. Rhodes, H. H. Hall, R. F. Anderson, G. E. N. Nelson, Margaret C. Shekleton, and R. W. Jackson.
Appl. Microbiol. 9(3): 181-184. May 1961.

The nitrogen, lysine, methionine, and tryptophan contents of 131 species of molds grown in shaken culture were determined. The average nitrogen content was 6.4 ± 1.3% of the dry weight; the average amounts of lysine, methionine, and tryptophan in the cells, expressed as gram of amino acid per 16 grams of nitrogen, were 6.8 ± 1.5, 1.2 ± 0.4, and 0.8 ± 0.3, respectively.

Molds are similar to yeasts with respect to methionine/nitrogen and tryptophan/nitrogen ratios and are like bacteria in regard to lysine/nitrogen ratio. The variability of the groups as indicated by the coefficients of variation, was lowest for yeasts; it was about equal for bacteria and molds, except that bacteria showed somewhat more variability in lysine content.

1255 PREPARATION AND PROPERTIES OF GALACTOSYLISOMALTOL AND ISOMALTOL.
J. E. Hodge and E. C. Nelson.
Cereal Chem. 38(3): 207-221. May 1961.

Isomaltol, an enolic compound ($C_6H_6O_3$) first isolated in trace amounts by Backe in 1910 from a steam distillate of bread, is now prepared from lactose in 25% overall yield. Dehydration of the glucose moiety of lactose by reaction with secondary amine salt in tertiary amine-buffered alcoholic medium yields the new compound, isomaltol beta-D-galactoside, which is hydrolyzed to pyrolyzed to produce Backe's isomaltol. Reaction of maltose with piperidine acetate under the same conditions yields 1-deoxyl-1-piperidino-maltulose. This new Amadori compound does not dehydrate to a glucoside of isomaltol analogous to the lactose reaction.

Comparison of the properties of isomaltol with those of maltol under identical conditions shows that isomaltol is not a pyrone but probably a furan derivative. Isomaltol and maltol probably are formed in bread by Maillard-type browning reactions, and not by fermentation, as Backe assumed.

1249 PREPARATION OF SOME ETHYL HIGHER-ALKYL ACETALS AND THEIR CONVERSION TO VINYL ETHERS.
W. J. DeJarlais, J. L. O'Donnell, and H. M. Teeter.
J. Am. Oil Chemists' Soc. 38(5): 241-243. May 1961.

Unsymmetrical acetals were prepared from stearyl, oleyl, and the mixed alcohols, derived from linseed oil, by the acid-catalyzed addition of each alcohol to ethyl vinyl ether.

Stearyl, oleyl, and linseed-alkyl vinyl ethers were obtained by cleavage of ethanol from the respective unsymmetrical acetals over alkali-metal bisulfates, sulfanilic acid, or aniline sulfate sulfuric acid. Yields of the higher alkyl vinyl ethers were moderate due to disproportionation and formation of ethyl vinyl ether from the acetals.

1259 PRESERVATION OF MICROORGANISMS BY FREEZE-DRYING. II. THE DESTRUCTIVE ACTION OF OXYGEN. ADDITIONAL STABILIZERS FOR SERRATIA MARCESCENS. EXPERIMENTS WITH OTHER MICROORGANISMS.
R. G. Benedict, E. S. Sharpe, J. Corman, G. B. Meyers, E. F. Baer, H. H. Hall, and R. W. Jackson.
Appl. Microbiol. 9(3): 256-262. May 1961.

The viability of dense populations of dried Serratia marcescens cells was markedly reduced by a 10-minute exposure to the oxygen of air. The damaging action of oxygen, which occurred at both 0 and 50% relative humidity, could be prevented by certain reducing agents.

Urea and several of its derivatives were very effective drying stabilizers for S. marcescens. The survivals of Leuconostoc mesenteroides and Pseudomonas aureofaciens, stabilized with urea, were equal to survivals obtained when processing was done with bovine serum.

Drying survivals of the sensitive yeasts, Saccharomyces capsularis and Eremothecium ashbyii, were much improved by the use of skim milk-glycerol or serum glucose, plus modifications of the drying method employed for S. marcescens.

1250 PRESSURE REACTION OF MALEIC ESTERS WITH VEGETABLE OILS.
W. R. Miller, E. W. Bell, J. C. Cowan, and H. M. Teeter.
J. Am. Oil Chemists' Soc. 38(5): 235-237. May 1961.

The reaction of dimethyl maleate and some related dienophiles with vegetable oils under pressure has been studied successfully. When safflower oil reacts with 100% excess maleate, sulfur dioxide catalyst, and hydroquinone inhibitor at 290° for 1 hr., 80 to 90% yields of adduct fraction, based on linoleate, are obtained. Under the same conditions almost equally good yields result with either linseed or soybean oils. With safflower oil, dimethyl fumarate gave slightly lower yields. Di-*n*-butyl maleate gave even poorer yields, and much residue was formed. Use of anthraquinone as catalyst gave a 53% yield, whereas a nickel conjugation catalyst gave 64%. If linoleate and linolenate are present, both will react, but the linolenate is more reactive. There is little reaction with oleate, and attempts to force such a reaction lead to decomposition, probably through reversal of the Diels-Alder reaction. The fragments then recombine to form nonvolatile residues.

1247 A SEARCH FOR NEW FIBER CROPS. PART III. LABORATORY-SCALE PULPING STUDIES.
G. H. Nelson, H. J. Nieschlag, M. E. Daxenbichler, I. A. Wolff, and R. E. Perdue, Jr.[1] [1](USDA Crops Research Division, Beltsville, Md.)
TAPPI 44(5): 319-325. May 1961.

The sulphate (kraft) pulping process combined with a simple refining procedure was applied experimentally to 1-lb. samples of 61 plant materials selected on the basis of analytical data obtained earlier in this series. Both raw material analyses and pulping data were analyzed statistically to assess differences in properties among selected botanical groups and to determine the extent of relationships among important variables. Generally, major differences were found in pulp properties and in response to pulping chemicals between grasses and dicotyledons. Pulp yields and strength properties of handsheets are given, along with data on chemical consumption, initial and final freeness, and permanganate numbers of the various pulps.

1253 A SIMPLE PREPARATION OF 1,4-ANHYDROERYTHRITOL.
F. H. Otey and C. L. Mehltretter.
J. Org. Chem. 26(5): 1673. May 1961.

A rapid and efficient method of dehydrating erythritol to erythritan has been developed. A distillation flask containing erythritol and a strong acid-type resin was heated at 140-180° C. at 0.5 mm. pressure. Near quantitative yields of erythritan were collected in the distillation receiver within about 35 minutes. No decrease in yield was observed with repeated use of the resin.

1251 TWENTY YEARS OF RESEARCH IN OILS AT NORTHERN REGIONAL RESEARCH LABORATORY.
J. C. Cowan.
J. Am. Oil Chemists' Soc. 38(5): 12-14, 16-18. May 1961.

Research conducted at the Northern Laboratory on vegetable oils during the past two decades include polymerization, isomerization, flavor stability, and structure. Some early accomplishments--dimeric fatty acids and their derivatives, conjugated oils and their aftertack, as well as the use of citric acid to inactivate iron in soybean oil--and more recent accomplishments--aldehyde oils, cyclic fatty acids, and tests for hidden oxidation and hydrazine reduction--are among subjects reviewed.

1282 AIR CLASSIFICATION OF RICE FLOURS.
A. C. Stringfellow, V. F. Pfeifer, and E. L. Griffin, Jr.
Rice J. 64(7): 30-32. June 30, 1961.

Three commercial rice flours milled from long-, medium-, and short-grain rice were air-classified before and after fine grinding in a pin mill. Results indicated some protein shift, but greater variations were observed in ash, fat, and particle size of the fractions. Ash and fat concentrated in the finer fractions and were reduced in the coarser fractions. Grinding the rice flour before fractionation reduced the coarse residue remaining after removal of most particles below 40 microns from about 80% of the original flour to about 55%. Although some protein shift was obtained, the chief potential advantages of air classification of rice flour appear to be reduction of ash and fat in the coarse residue, comprising the bulk of the flour, and in control of particle size.

1269 DIALDEHYDE STARCH RETENTION BY USE OF CATIONIC STARCH FOR HIGH WET-STRENGTH PAPER.
G. E. Hamerstrand, B. T. Hofreiter, C. L. Mehltretter, W. E. Schulze, and Daniel J. Kay.
TAPPI 44(6): 430-433. June 1961.

Studies were made on the use of cationic starch as an alternative to alum as a retention aid in the wet-end addition of dialdehyde starch. Practical optimum conditions of application were established by studies on concentration and amount of additives employed; sequence of addition; and influence of pH, time, and temperature. The amount of additive retained and the physical properties of paper made from a variety of pulps were determined.

The degrees of wet strength imparted were found to vary somewhat with the kinds of pulps used. For dialdehyde starch retentions of 0.5 to 0.8%, dry pulp basis, the average wet tensile for representative pulps was 40% of the untreated dry control paper, with a maximum value of 60%. Either dialdehyde starch or cationic starch used alone contributes to dry strength increases, and substantial increases result from combinations of the two starches.

1294 HIGH-AMYLOSE CORN STARCH FRACTIONS.
Edna M. Montgomery, K. R. Sexson, and F. R. Senti.
Stärke 13(6): 215-222. June 1961.

To compare high-amylose corn starch and its fractions with ordinary or dent corn starch and its fractions, high-amylose corn starches selected at six different levels of amylose content (apparant amylose as shown by iodine affinity was 50 to 71%) were separated into amylose and amylopectin. Separation was attained by the granule pretreatment-extraction procedure, used by Montgomery and Senti for fractionation of dent corn starch, with some modification.

High-amylose corn amylose, isolated in yields accounting for 80% of the iodine affinity of the starch, resembled dent corn amylose in molecular size, as shown by intrinsic viscosity and molecular weight by light scattering, and in purity, as measured by iodine affinity. As the amylose content of the granule increased, amylopectin showed increased iodine affinity but lowered molecular weight.

1270 INTERFACE AND MENISCUS WIDTHS AND POSITIONS FOR LOW-SPEED ULTRACENTRIFUGE RUNS.
Stig R. Erlander and Glen E. Babcock.
Biochim. Biophys. Acta 50(2): 205-212. June 24, 1961.

Experimental investigations were carried out to obtain satisfactory conditions for low-speed centrifugation runs. Factors such as rotor stability and the position and width of meniscus are important in order to determine the molecular weight of extremely large polymers by equilibrium ultracentrifugation. By reducing the vibration of the drive mechanism, it was possible to obtain an extremely steady rotor at speeds around 1,000 r.p.m. The true position of the meniscus and some factors which determine its width are discussed.

1252 LOW-TEMPERATURE CRYSTALLIZATION APPARATUS FOR SEMIMICRO QUANTITATIVE WORK.
John P. Friedrich.
Anal. Chem. 33(7): 974-975. June 1961.

An apparatus is described for carrying out fractional crystallizations at low temperatures.

1279 OCCURRENCE OF POLYISOPRENE IN LACTARIUS SPECIES.
Ralph F. Anderson, Thomas I. Baker, Lawrence G. Jayko, and Robert G. Benedict.
Biochim. Biophys. Acta 50(2): 374-375. June 24, 1961.

The formation of low molecular-weight rubber by *Lactarius* Pers. ex S. F. Gray grown in their natural habitat has been confirmed. However, when several representatives of this genus were propagated in the laboratory under various conditions of submerged growth, they produced no detectable *cis*-polyisoprene.

1244 SURFACE DRYING OF LINSEED OIL EMULSION PAINTS.
A. W. Schwab, W. L. Kubie, J. A. Stolp, J. C. Cowan, and H. M. Teeter.
Offic. Dig., Federation Soc. Paint Technol. 33(437): 747-758. June 1961.

Surface dry of linseed oil emulsion paints has been observed in the first half hour after application. Neither kind of thickener nor small variations in water content appeared to have an important effect on surface-dry time or water sensitivity of the nonionic paint formulations studied. Films from the ionic formulations examined had poor water resistance but could be improved by using hydroxyethyl cellulose as a thickener. A study of drying curves of pigmented and unpigmented linseed oil emulsions failed to show any evidence of inversion during drying.

CONTRACT RESEARCH PUBLICATIONS

[Report of research work done by an outside agency under contract with the U. S. Department of Agriculture and supervised by the Northern Utilization Research and Development Division of the Agricultural Research Service.]

84-C AN ACCELERATED TEST OF THE YELLOWING TENDENCY OF DRYING OILS.
O. S. Privett, M. L. Blank, and W. O. Lundberg.
Hormel Institute, University of Minnesota, Austin.
J. Am. Oil Chemists' Soc. 38(1): 27-30. January 1961.

85-C YELLOWING OF OIL FILMS.
O. S. Privett, M. L. Blank, J. B. Covell, and W. O. Lundberg.
Hormel Institute, University of Minnesota, Austin.
J. Am. Oil Chemists' Soc. 38(1): 22-27. January 1961.

93-C THE PREPARATION AND POLYMERIZATION OF SOME LONG-CHAIN MONO-, DI-, AND TRIOLEFINS WITH METAL COORDINATION CATALYSTS.
C. S. Marvel and John R. Rogers. University of Illinois, Urbana.
J. Polymer Sci. 49(152): 335-352. February 1961.

90-C THE CONTROL OF FUNGI DURING THE MALTING OF WHEAT.
James R. Fleming, John A. Johnson, and Byron S. Miller.
Kansas State University, Manhattan.
Cereal Chem. 38(2): 170-178. March 1961.

91-C EFFECTS OF POTASSIUM GIBBERELLATE ON THE PRODUCTION OF ALPHA- AND BETA-AMYLASE AND PROTEASE ACTIVITIES DURING THE MALTING OF WHEAT.
James R. Fleming and John A. Johnson. Kansas State University, Manhattan.
J. Agr. Food Chem. 9(2): 152-155. March-April 1961.

96-C RELATIONSHIP BETWEEN PHYSICAL CHARACTERISTICS AND MILLING SCORE OF KERNELS OF SOFT WHEAT VARIETIES. I. THICKNESS OF ENDOSPERM CELL WALLS.
Richard A. Popham and Richard H. Eyde. Ohio State University, Columbus.
Econ. Botany 15(2): 140-145. April-June 1961.

97-C RELATIONSHIP BETWEEN PHYSICAL CHARACTERISTICS AND MILLING SCORE OF KERNELS OF SOFT WHEAT VARIETIES. II. INHIBITION OF WATER.
Richard A. Popham and Richard H. Eyde. Ohio State University, Columbus.
Econ. Botany 15(2): 145-150. April-June 1961.

98-C RELATIONSHIP BETWEEN PHYSICAL CHARACTERISTICS AND MILLING SCORE OF KERNELS OF SOFT WHEAT VARIETIES. III. RESISTANCE TO COMPRESSION.
Richard A. Popham, Richard H. Eyde, Richard J. Naskali, and Pien-Chien Huang. Ohio State University, Columbus.
Econ. Botany 15(2): 150-155. April-June 1961.

95-C THE CARBOHYDRATES OF THE GRAMINEAE. XI. THE CONSTITUTION OF THE WATER-SOLUBLE POLYSACCHARIDES DERIVED FROM BREAD CRUMB.
Kenneth A. Gilles, W. F. Geddes, and Fred Smith.
University of Minnesota, St. Paul.
Cereal Chem. 38(3): 229-240. May 1961.

94-C THE SELECTIVE HYDROGENATION OF LINOLENIC ACID.
John G. Willard and Maria Luisa Martinez.
Southwest Research Institute, San Antonio, Texas.
J. Am. Oil Chemists' Soc. 38(6): 282-286. June 1961.

[Report of research work supported with funds provided by the U. S. Department of Agriculture under the authority of U. S. Public Law 480, 83rd Congress, and sponsored by the Northern Utilization Research and Development Division.]

3-PL 480 CYCLO-ARTHENOL: A MINOR CONSTITUENT OF LINSEED OIL.
Pompeo Capella.
Stazione Sperimentale Olii e Grassi, Milan, Italy.
Nature 190(4771): 167-168. April 8, 1961.

10-PL 480 A KINETIC STUDY OF THE MILD OXIDATION OF WHEAT STARCH BY SODIUM HYPOCHLORITE IN THE ALKALINE pH RANGE.
J. Schmorak, D. Mijzler, and M. Lewin.
Institute for Fibres and Forest Products Research, Ministry of Commerce and Industry, Jerusalem, Israel.
J. Polymer Sci. 49(152): 203-216. February 1961.

**ADD TO ARS-71-3, SUPPLEMENT 9

1083 * REACTION OF UNSATURATED ORGANIC COMPOUNDS WITH TRITIUM GAS.
Herbert J. Dutton and Robert F. Nystrom.[1] ([1]Radiocarbon Laboratory, University of Illinois, Urbana).
Proc. Symposium Tritium Tracer Appl. New York, October 31, 1958. Pp. 8-15.

The incorporation of tritium into saturated organic compounds by the Wilzbach gas-exposure technique substitutes tritium for hydrogen. In contrast, addition is the principal reaction in labeling unsaturated fatty acid esters. Depending upon the structure of the organic compounds, tritium either adds, substitutes, or both. Results with cyclohexene, cholesterol, vitamin A, and isobutene are presented.

**ADD TO ARS-71-3, SUPPLEMENT 11

1242 A NEW HALOPHILIC SPECIES OF EUROTIUM.
C. M. Christensen,[1] G. C. Papavizas,[1] and C. R. Benjamin.
([1]University of Minnesota, St. Paul).
Mycologia 51(5): 636-640. September-October 1959.

Samples of wheat obtained from terminal elevators in several parts of the country were stored in 4 oz. prescription bottles with screw caps having rubber liners. The wheats had moisture contents between 13 and 14%, wet weight basis, when placed in the bottles. After about 2 years, mycelium was observed on the embryo surface of many of the seeds. A number of seeds of each of several samples were placed, without prior surface disinfection, on malt agar containing 15% sodium chloride, a medium we frequently have used to isolate Aspergillus restrictus from seeds. After 10 days, the surface of the germs of most seeds

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** Notice of publication omitted from this issue.

was covered with white perithecia. The perithecia developed on the germs of hard red winter wheat from Omaha, Nebraska, soft red winter wheat from Marietta, Pennsylvania, and Chicago, Illinois, and white wheat from Buffalo, New York, and Maumee, Ohio. Several isolates of the fungus were studied in some detail and the fungus appeared sufficiently different from known species of _Eurotium_ and _Aspergillus_ to warrant description as a new species.

1102 * RESEARCH ON INDUSTRIAL UTILIZATION OF WHEAT.
F. R. Senti.
Proc. Wheat Util. Conf., sponsored by Agricultural Experiment Stations of Idaho, Oregon, and Washington and the Wheat Commissions and Wheat Growers Associations of Idaho, Oregon, and Washington, Walla Walla.
October 1959. Pp. 5-22.

A presentation of the industrial uses of wheat, stressing the need for basic research to find new uses.

1103 * NEW CROPS--SCREENING AND DEVELOPMENT RESEARCH.
Ivan A. Wolff.
Proc. Wheat Util. Conf., sponsored by Agricultural Experiment Stations of Idaho, Oregon, and Washington and the Wheat Commissions and Wheat Growers Associations of Idaho, Oregon, and Washington, Walla Walla.
October 1959. Pp. 93-105.

Encouraging results are reported from a 3-year-old program based on chemical screening of seeds and stalks of plant species not presently cultivated in the United States. Promisingly high contents of valuable oil, protein, and nonstarch polysaccharides were demonstrated in many of the 1,800 seed samples analyzed. Often the major constituents had unique and potentially valuable chemical structures and properties that warrant further studies. Development of an efficient scheme for screening possible new pulp fiber crops permitted selection of several species worthy of additional utilization and crop production studies for this end use. New crop needs and opportunities, program organization, screening objectives, and research developments are reviewed.

1240 MICROBIAL PRODUCTION OF CAROTENOIDS. VI. SOME FACTORS AFFECTING SPORULATION AND GROWTH IN THE CHOANEPHORACEAE.
C. W. Hesseltine and C. R. Benjamin.
Mycologia 51(6): 887-901. November-December 1959.

Growth and sporulation factors for unmated (+) and (-) strains of all four available species of _Choanephora_ and _Blakeslea_ were studied. Carbon-nitrogen ratio requirements differed among species. With glucose as the carbon source, ammonium sulfate and asparagine as the nitrogen source, glucose and cellobiose were the best of 17 carbon compounds tested. Cultures generally sporulated best at temperatures of 25-28° C and under alternating periods of light and darkness. Sporulation was not generally enhanced by the presence of other microorganisms. Some natural variants selected from plate cultures of B. trispora and C. circinans still retained their individuality after 7 transfers over a period of 18 months.

1239 STUDIES ON THE GENUS PHYCOMYCES.
C. R. Benjamin and C. W. Hesseltine.
Mycologia 51(6): 751-771. November-December 1959.

The genus Phycomyces has been reviewed and revised taxonomically. It has been found to comprise the three species, P. nitens Kunze, P. blakesleeanus Burgeff, and P. microsporus Van Tieghem. P. spinulosus Morini is treated as a doubtful species, and P. pirottianus is reduced to synonymy with P. nitens. Descriptions and synonymy are presented, as are the results of numerous mating experiments with strains of P. nitens subjected to various experimental conditions.

ADD TO ARS-71-3, SUPPLEMENT 12

1275 HANSENULA ANGUSTA, AN EXCELLENT SPECIES FOR DEMONSTRATION OF THE COEXISTENCE OF HAPLOID AND DIPLOID CELLS IN A HOMOTHALLIC YEAST.
Dorothea J. Teunisson,[1] Harlow H. Hall, and Lynferd J. Wickerham. ([1]Southern Utilization Research and Development Division, New Orleans.)
Mycologia 52(2): 184-188. March-April 1960.

Hansenula angusta is a species of yeast associated with deciduous trees and disseminated by bark beetles and fruit flies. It exists in nature predominantly in the haploid form but a small percentage of diploid cells are generally present. Ascospores impart a red color to the colonies when they are 4 to 8 days old, the diploid colonies having a denser color than the haploid colonies because diploid cells of homothallic yeasts generally sporulate sooner and more abundantly than the haploid cells. This species is recommended for classroom demonstration of the following general characteristics of homothallic yeasts which exist in both the haploid and diploid forms: Haploid cells are smaller than diploid. Haploid cells produce conjugation tubes whereas diploids do not, and the asci formed from haploids are smaller and are conjugated, while those produced by diploids are larger and are unconjugated. The haploid cells diploidize at a slow rate while growing vegetatively, but the diploids evidently must sporulate in order to return to the haploid state. Either form may be derived and maintained in practically pure state by selection and lyophilization.

1274 HANSENULA HOLSTII, A NEW YEAST IMPORTANT IN THE EARLY EVOLUTION OF THE HETEROTHALLIC SPECIES OF ITS GENUS.
Lynferd J. Wickerham.[1] ([1]With the technical assistance of Kermit A. Burton and Jane A. Roberson).

Mycologia 52(2): 171-183. March-April 1960.

Hansenula holstii is the most primitive heterothallic haploid species of its genus discovered to date. Few natural isolates react sexually and when they do, they produce few ascospores. When ascosporic isolates are inbred, mating types are obtained that react strongly. An ascosporogenous bisexual diploid has been produced in the laboratory.

1288 RELATIONSHIPS OF THE ACTINOMYCETALES.
C. W. Hesseltine.
Mycologia 52(3): 460-474. May-June 1960.

The evolutionary scheme proposed involves a series of organisms showing morphological and physiological relationships beginning with a sporangial ancestor with motile spores evolving to reduced spore production and nonmotile spores. This scheme seems best to fit the facts as they exist today. Although related both to fungi and to bacteria, especially the propionic bacteria, the actinomycetes would appear to be a separate phylogenetic line. Whether this theory is acceptable or not will await many more comparative studies of morphology, physiology, and chemistry.

From a practical standpoint we are certain that actinomycetes must be isolated, grown, and studied more as if they were fungi than bacteria because: (1) Spores and spore germination are like those of fungi. (2) Vegetative growth in surface and submerged culture is funguslike. (3) Mycological characteristics used in identification seem most fundamental. (4) Methods required for maintaining vigorous and stable cultures are like those used for fungi. (5) The colony and its mode of growth are more funguslike than bacterial.

ADD TO ARS-71-3, SUPPLEMENT 13

1310 FURTHER INVESTIGATIONS ON THE PRESERVATION OF MOLDS.
C. W. Hesseltine, Barbara J. Bradle, and C. R. Benjamin.
Mycologia 52(5): 762-774. September-October 1960.

Representative lyophil cultures of the Mucorales, Entomophthorales, Ascomycetes, Fungi Imperfecti, and Actinomycetes, the majority being 17 years old, were opened. Of the 363 cultures tested, 331 were viable. Seventeen of those not viable did not contain spores. Morphological characteristics remained constant during lyophilization and, in a few exceptions where differences occurred, they were better than those periodically transferred. Of the 199 cultures of Mucorales preserved by the oil overlay method for more than 11 years, 79 were viable. Of the 241 cultures of Mucorales preserved on malt agar slants for more than 9 years, 45 were viable.

**ADD TO ARS-71-3, SUPPLEMENT 13

CONTRACT RESEARCH PUBLICATION

92-C REACTIVITY RATIOS OF VINYL 2-CHLOROETHYL ETHER IN CATIONIC COPOLYMERIZATION WITH VINYL ALKYL ETHERS AND PARA-SUBSTITUTED α-METHYLSTYRENES.
J. F. Dunphy and C. S. Marvel. University of Illinois, Urbana.
J. Polymer Sci. 47(149): 1-8. November 1960.

PATENTS

[These patents are assigned to the Secretary of Agriculture. Copies of patents may be purchased from the U. S. Patent Office, Washington 25, D. C.]

PREPARATION OF MISO.

Allan K. Smith, Clifford W. Hesseltine, and Kazuo Shibasaki.
U. S. Patent 2,967,108. January 3, 1961.

Miso is prepared by a *Saccharomyces rouxii* fermentation of a mixture of cooked hull-free soybean grits, mold rice, salt, and water.

COPOLYMERIZATION METHOD.

Gus C. Mustakas and Edward L. Griffin, Jr.
U. S. Patent 2,967,166. January 3, 1961.

Stannic chloride catalyzed soybean polyunsaturated vinyl ether copolymerization with a lower alkyl vinyl ether is conducted in an anhydrous organic solvent and quenched with an anhydrous lower alcohol, thus avoiding the formation of a troublesome stannic acid gel, Turbo-agitation continued until the polymerization is interrupted by quenching prevents development of a strong decolorization-resistant yellow color. The stannic ions are removed by precipitation with a small amount of hydrated alkali earth metal hydroxide such as lime.

PRODUCTION OF ERYTHROSE AND GLYOXAL FROM DIALDEHYDE STARCH.

John W. Van Cleve and Charles L. Mehltretter.
U. S. Patent 2,973,387. February 28, 1961.

Method of producing high yield mixtures of glyoxal and erythrose in substantially equal proportions by hydrolyzing a weak concentration of dialdehyde starch at elevated pressure and temperature in the presence of sulfurous acid.

PROCESS FOR SEPARATION OF SODIUM METAPERIODATE FROM SODIUM SULFATE.

Charles L. Mehltretter and Carl S. Wise.
U. S. Patent 2,989,371. June 20, 1961.

The invention relates to methods for the separation of the two components from aqueous solutions by concentration of the compounds to certain values at certain specific temperatures determined by application of the phase rule to the system, crystallization and separation of the sodium metaperiodate and subsequent separation of the sodium sulfate by crystallization and filtration from the solution. The preferred method is to evaporate the solution to obtain a sodium sulfate content of 46.0 grams in 100 grams of water at 37° C., crystallizing and isolating the sodium metaperiodat by filtration at 37° C., cooling the filtrate of the said metaperiodate crystals to 26° C., and crystallizing and isolating the sodium sulfate decahydrate by filtration at this temperature. The above step may be repeated. Total yields of 96% of nearly pure sodium metaperiodate was obtained in three crystallization steps.

METHOD OF CROSS-LINKING AND OXIDIZING STARCH.
Frederic R. Senti, Russell L. Mellies, and Charles L. Mehltretter.
U. S. Patent 2,989,521. June 20, 1961.

Starch cross-linked to the extent of about 25-300 AGU's/cross-link with epichlorohydrin is oxidized with sodium hypochlorite under alkaline conditions to form starch containing between about 9 to 3 moles of carboxyl per 100 AGU's, the extent of oxidation varying substantially with the extent of cross-linking, the resulting starches having moderate, heat-stable paste viscosities, high clarity, and resistance to reversion and set-back.

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